



Incidence and prevalence of Parkinson's disease in the Italian region of Umbria: a population-based study using healthcare administrative databases

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Abstract

Parkinson's disease is known to pose a significant burden on society in industrialized countries. However, few studies have been conducted in Italy using administrative healthcare databases for epidemiological purposes. We wanted to estimate the incidence and prevalence rates of Parkinson's disease in the Italian region of Umbria by means of linkage between several sources of administrative healthcare data: hospitalization episodes, exemptions from medical charges, drug prescriptions from general practitioners and physicians working in the public sector. Using a pre-defined algorithm, we estimated incident and prevalent cases of Parkinson's disease for the year 2016. The regional incidence rate, adjusted with Italian standard population data, was 0.40 new cases/1000 person-years (0.41 in females, 0.39 in males). We estimated that 5550 subjects were affected by Parkinson's disease, leading to an age-adjusted prevalence rate of 5.42/1000 inhabitants. Prevalence and incidence increased with age and male gender. However, due to the longer life expectancy of females, the absolute number of prevalent cases was greater among females. The heterogeneity of spatial distribution of disease was high. A considerable proportion of prevalent cases was hospitalized in 2016. The most recurrent reasons for hospitalization episodes were disorders related to the nervous system, respiratory system, cardiovascular system, and musculoskeletal and connective tissue apparatus. The study findings support the feasibility of future epidemiological studies of Parkinson's disease with administrative data as well as the need for an integrative care pathway for the patients with Parkinson's disease.

Keywords Parkinson's disease · Epidemiology · Incidence · Prevalence

Introduction

Parkinson's disease (PD) is a progressive neurodegenerative disorder, characterized by bradykinesia and at least one of three other cardinal clinical signs: resting tremor, rigidity, and impaired postural stability. Prevalence rates increase with

age, with an overall worldwide estimate of 3.15 per 1000 according to a meta-analysis [1].

The development of validated algorithms for using the health administrative data to identify PD cases could lower the cost of epidemiological studies and estimate the costs and the burden of disease in real time. Population studies based on administrative data could also assess the role of potential risk factors, comorbidities, adverse events related to pharmacological interventions, unfavorable outcomes such as progression to dementia, and hospitalizations. The first aim of the present study was to use healthcare administrative data for estimating the incidence and prevalence of PD in the whole Italian region of Umbria. The second aim of the study was to investigate the distribution of drug prescriptions and the occurrence of hospitalization in subjects suffering from PD. The results will be interpreted in light of systematic literature of previous Italian experiences.

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Materials and methods

Systematic literature review

Systematic literature search was performed from inception to 2018 (March) in PubMed. We used a simplified version of the search strategy developed by Benchimol and colleagues [2] for capturing studies that use healthcare administrative databases. Reference lists of retrieved articles and hand searches were examined for relevant publications.

Administrative healthcare databases

The regional health information system was used for identification of PD cases. The system covers the entire regional population (approximately 900,000 inhabitants) and includes several electronic administrative databases, which can be linked each other on an individual basis, through a unique encrypted identifier.

The data sources included the following: the database of the regional potential health care beneficiaries, the hospital discharge database, the pharmaceutical prescription database, and the database of exemptions from medical charges. For searching the drug prescriptions, we used the same algorithm

proposed in the study of North eastern Italian region Friuli-Venezia Giulia [3].

The hospital discharge database includes records from all the regional hospitals (either public or private accredited to the public health system). The pharmaceutical prescription database includes information on all the prescriptions made by general practitioners or physicians working in public hospitals). The database of exemptions from medical charges contains records on all the individuals that can benefit from treatments and diagnostic procedures for free, due to low income, older age, or impairing chronic diseases.

Case ascertainment

Among subjects living in the Umbria region, we identified those with PD by linking all the abovementioned databases in the years 2010–2016 and selecting patients fulfilling any of the following criteria: (i) hospitalization episode with any discharge diagnosis with ICD-9-CM code 332.xx, (ii) an exemption from medical charges with national exemption code 038, and (iii) at least three prescriptions of drugs prescribed for PD (ATC codes N04xxxx) in a timeframe of 6 months, excluding patients who had any prescriptions of antipsychotic drugs (ATC codes

Table 1 Sex- and age-specific incidence and prevalence rates of Parkinson's disease in the Italian region Umbria. Age > 40 years. Year 2016

Age	Incidence		Male		Total	
	Cases	Rate	Cases	Rate	Cases	Rate
40–44	2	0.06	1	0.03	3	0.04
45–49	1	0.03	0	0.00	1	0.01
50–54	3	0.08	3	0.09	6	0.09
55–59	3	0.10	4	0.14	7	0.12
60–64	6	0.21	9	0.34	15	0.27
65–69	11	0.37	14	0.51	25	0.44
70–74	18	0.74	22	1.04	40	0.88
75–79	42	1.65	44	2.16	86	1.88
80–84	61	2.92	43	2.95	104	2.93
85+	71	2.77	47	3.92	118	3.14
Age	Prevalence		Male		Total	
	Cases	Rate	Cases	Rate	Cases	Rate
40–44	21	0.60	20	0.60	41	0.60
45–49	22	0.62	35	1.03	57	0.82
50–54	39	1.10	46	1.38	85	1.24
55–59	65	2.07	64	2.20	129	2.14
60–64	89	3.11	114	4.36	203	3.70
65–69	161	5.44	219	8.04	380	6.68
70–74	242	10.00	348	16.49	590	13.03
75–79	480	18.91	514	25.25	994	21.73
80–84	681	32.61	609	41.78	1290	36.38
85+	1048	40.93	659	54.93	1707	45.40

N05xxxx) before the first prescription of anti-PD drug. Exclusion of atypical parkinsonisms was considered according to specific drug prescription patterns [3].

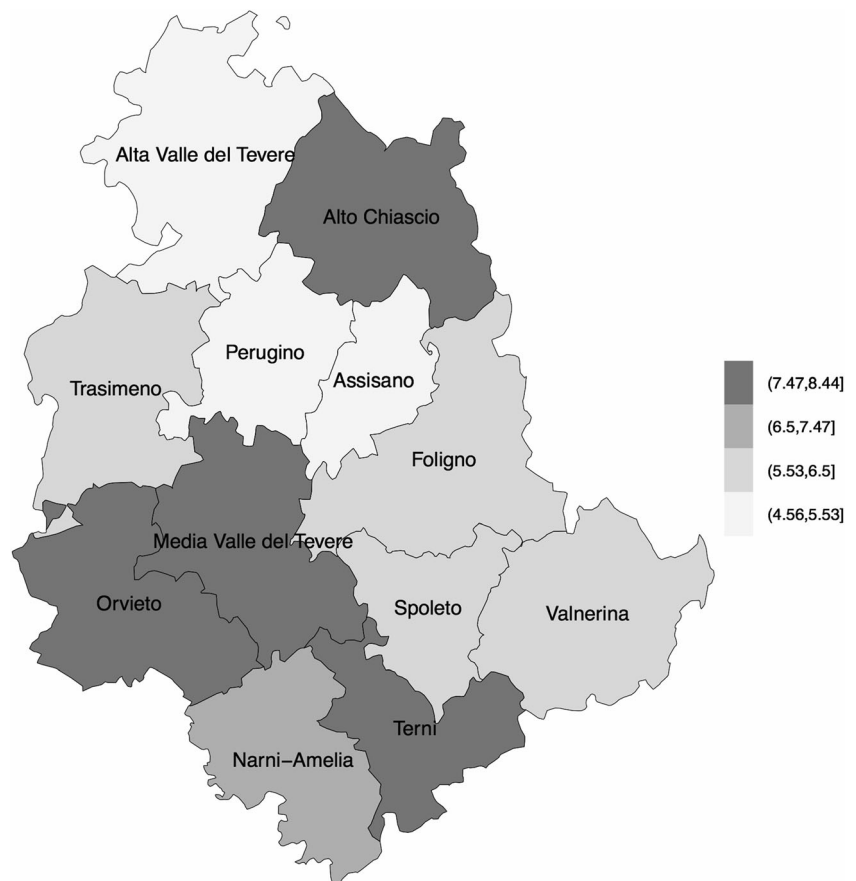
Data analysis

Specific incidence and prevalence rates of PD were calculated in each age group. Overall estimates were standardized according to the Italian standard population. Categorical data were reported as count and percentage while continuous variables were summarized as mean \pm standard deviation with ranges. The spatial distribution of disease was mapped at the healthcare district level. SAS v 9.0 and R v 3.5 were used for database management and data analysis, respectively.

Results

According to our systematic review, three studies reported the incidence or prevalence of PD in different regions of Italy by using healthcare administrative data [3–6], with estimates of PD incidence rates ranging from 2.8 to 4.9 per 1000 person-years, while observed prevalence rates ranged from 2.8 to 4.9 per 1000 per inhabitants.

Fig. 1 Distribution over local health districts of the prevalence rates of Parkinson's disease in Umbria. Year 2016



In 2016, 411 subjects living in the Umbria region fulfilled at least one criterion for PD for the first time. The overall age-adjusted incidence rate was 0.40 new cases/1000 person-years (0.41 in females, 0.39 in males). The incidence rate increased with age. Both the number of incident cases and incident rates were greater among men than women across the age groups (Table 1).

We estimated that 5550 subjects affected by PD were living in the Umbria region as of December 31, 2016, which led to an age-adjusted prevalence rate of 5.42/1000 inhabitants. Overall, about 90% of the estimated prevalent cases fulfilled the drug prescription criterion.

Prevalence increased with age and, in all age groups \geq 45 years, was greater among men than among women, although the absolute number of prevalent cases was greater among females (Table 1). Age-adjusted prevalence rates were thus comparable (5.44/1000 in females and 5.40 in males).

In 2016, 76.2% of the prescribed treatments were levodopa and levodopa derivatives, while dopamine agonists and monoamine oxidase B inhibitors were 8.1% and 8.6%, respectively.

Of all prevalent cases, 1443 (26%) were hospitalized in 2016. The hospital stay varies between 1 and 38 days, with a mean of 3.8 days and a standard deviation of 5.9. The mean age at discharge was 77.4 ± 13.4 .

The most recurrent reasons for hospitalization episodes were disorders related to the nervous system (21.3%), respiratory system (12.9%) cardiovascular system (12.4%), and musculoskeletal and connective tissue (12.1%). In Fig. 1, we plotted the prevalence rates within each health district of the Umbria region. The plot shows how the variation is largely, but not totally dependent, of the age structure (which is older in the southern part). In several healthcare districts, the crude prevalence rates are two times higher compared to other districts.

Discussion

We were able to analyze multiple administrative health-related databases for estimating the incidence and prevalence of PD in Umbria. Both incidence and prevalence estimates were higher compared to previous observations, although trends across age groups and sex were similar. Difference in database accuracy and geographical variability could explain heterogeneity in incidence and prevalence estimates between Umbria and other Italian regions. It is unclear whether higher estimates of prevalence and incidence are due to higher sensitivity of healthcare databases or lower specificity. A large proportion of patients was hospitalized in the reference year, confirming the significant disease burden. Our findings represent key steps for estimating the healthcare costs and planning integrative care pathways for the care of patients with PD.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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